INDIANA STATE BOARD OF HEALTH

Bibliography of Files

To	Date.	From:	Purpose:
R. Dove/ISBH	Dec. 9, 1974	Miles Lab	Extension of closure
File	Sept. 9, 1980	H. Liebrich/ISBH	Complaint of contamination
City of Elkhart	Nov. 27, 1974	M. Sever	Miles Experimental Landfill
File	Nov. 15, 1974	C. Menze/ISBH	Water analysis
Fenton/ISBH	April 17, 1975	J. Ellis/Attorney	Contamination-Wiseman
C.H. Himes Jr.	Sept. 24, 1976	R.P. Dove/ISBH	Earthmovers Waste
File	Sept. 16, 1976	G. Doyle/ISBH	Wastes at Himco
R. Dove/ISBH	May 6, 1976	R. Raney/Elkhart Truth	Himco
G. Oliver/ISBH	May 12, 1976	C.H. Himes Jr.	Panel discussion on landfills
D. Lamm/ISBH	June 3, 1976	C.H. Himes Jr.	Medical wastes
File	June 14, 1976	D. Lamm/ISBH	ISBH inactivity
File	Feb. 23, 1977	D. Lamm/ISBH	Contamination/Study
File	March 15, 1978	D. Lamm/ISBH	C. Menze conversation
C. Himes Jr.	June 17, 1976	D. Lamm/ISBH	Hospital waste disposal
H. Bowen/Governor	April 5, 1977	W. Paynter/Health Comm.	Rumfelt response
ISBH	?	P. Rumfelt	List of wastes
D. Lamm/ISBH	Sept. 8, 1981	K. Fenner/US EPA	Investigation
D.H. Hert/ISBH	Jan. 4, 1978	D. Lamm/ISBH	Response for MACOG meeting
D. Lamm/ISBH	Jan.3, 1978	J. King/ISBH	Response for MACOG meeting
E. Yeagley/Miles	Jan. 6, 1976	R. Dove/ISBH	Classify Calcium Sulfate
E. Hartyerink/Miles	June 11, 1976	D. Lamm/ISBH	Waste disposal
G. Oliver/ISBH	July 19, 1976	C. Himes Jr.	Demolition material
A. Giles/US EPA	March 17, 1976	R. Dove/ISBH	Investigation
C. Himes Jr.	May 21, 1976	D. Lamm/ISBH	Information on wastes
Miles Lab	Jan. 30, 1975	W. Campbell/Elkhart	Calcium Sulphate
Miles	April 22, 1975	O. Hert/ISBH	Experimental landfill
C. Menze	Feb. 3, 1975	F. Breckenridge/Miles	Experimental landfill
C. Menze	Dec. 20, 1974	P. Francis/Miles	Experimental landfill
NHWS	June 12, 1981	Himco Waste Away	Waste at Earthmovers
NHWS	June 12, 1981	Earthmovers Inc.	Waste at Earthmovers

NHWS (Notification of Hazardous Waste Site)
Report: Regional Ground Water Problems Nov. 9, 1977 Keith Harrison
Report: Hydrological and Chemical Evaluation of the Groundwater Resources of Northwest Elkhart County, Indiana - Indiana Dept. of Natural Resources
Newspaper Articles - Elkhart Truth
Elkhart Ground Water Study - Water Analysis

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
100 NORTH SENATE AVENUE
P.O. BOX 6015
INDIANAPOLIS, INDIANA 46206-6015

Date: 1/5/05	Fax #: 312-886-4071
Company/Division:	Telephone #:
To: Gwen Massenburg	

From: Jessica Fliss	Telephone #: Fax #:
Office/Branch/Section:	Number of Pages (including cover): 23

Comments:
I'm sending these in batches.
This is batch #2

IDEM Location		Fax Number Area Code (317)	Confirm Number Area Code (317)
	Indiana Government Center North		
Commissioner's Office		233-6647	232-8162
Enforcement		233-5968	233-5529
Land Quality		232-3403	232-4473
Land Quality		234-0428	233-2570
Water Quality		233-5968	233-5529
Air Quality		232-8406	232-8670
Legal Counsel		233-5967	233-0178
Media & Communications		233-5517	232-8753
Office of Mgmt., Budget, & Admin.		232-8564	232-8560
Information Technology		232-5539	232-8180
Purchasing		233-6276	232-0764
Office of Pollution Prevention		233-5627	233-5434
	Western Select Properties	Area Code (317)	Area Code (317)
Drinking Water		308-3339	308-3280
Water-Assessment		308-3219	308-3176
Water-Drinking Water Compliance		308-3340	308-3282
Air Quality		308-3239	308-3236
Land Quality Compliance Branch		308-3063	308-3017
	Regional Offices		
Northwest Office	Merrillville, IN	(219) 757-0267	(219) 757-0265
North Central Office	South Bend, IN	(574) 245-4877	(574) 245-4870
Southwest Office	Petersburg, IN	(812) 380-2304	(812) 380-2305

CA... This may resolve [illegible] problems.

MILES LABORATORIES, INC.
ELKHART, INDIANA 46514

MARSCHALL DIVISION

File: Miles Laboratories

PHONE: 219 264-8716
TWX: 810 294-2249
CABLE: MILESLABS ELK

December 20, 1974

Mrs. Chris Menze
Solid Waste Management
Division of Stream Pollution Control Board

Dear Mrs. Menze,

To confirm our phone conversations of December 19 and 20 on the leaching study of calcium sulfate, I shall write this memo.

In the original leaching studies on calcium sulfate of November 20, 1974, that was submitted to your office, there was a question on the low pH of the filtrate. We used deionized water for that study which had a low pH of 4.60. We used this water to leach the calcium sulfate because of its high purity and then if anything was leached out of the calcium sulfate we could analyze for the impurities caused by the calcium sulfate. Unfortunately, we did not realize pH would be one of your important concerns. If you will notice in the leaching studies after the first fraction of water had gone through the calcium sulfate, the second and third fractions of the pH was practically the same as the pH of the water going into the calcium sulfate.

Your concern of the pH of the filtrate made us wonder and we rechecked our deionized water again today and still got a pH of 4.60. We then checked distilled water at different locations in our company and found it to be below 6 so we again did the leaching study using our own tap water which has a pH of 8.

This leaching study was carried out on the calcium sulfate produced in production on this date as per the original procedure. This is referred to below as wet calcium sulfate. A duplicate test was run on a portion of the same calcium sulfate after it had been repulped in the manner that all the calcium sulfate will be after March 1, 1975. Results of this test is as follows:

Sample	First 200 ml of Water Through Sample	Second 200 ml of Water Through Sample	Third 200 ml of Water Through Sample
50 gms $CaSo_4$ from Plant (wet)	3.16	6.24	7.65
50 gms of Repulped $CaSo_4$	7.41	7.45	7.49
Water Used in Test	7.98	8.02	8.04

P. D. Francis
Manager, Process & Quality Control
Citric Manufacturing

PDF/sjn

cc: F. Breckenridge
E. Hartgerink
O. Wegrich
E. Yeagley, Jr.
C. Whistler

CM

MILES LABORATORIES, INC.
ELKHART, INDIANA 46514

FRANKLIN E. BRECKENRIDGE
ATTORNEY

TELEPHONE: 219-264-8082
CABLE ADDRESS: MILESLABS
TELEX: 284-456

February 3, 1975

Mrs. Chris Menze
Public Health Sanitarian
Division of Sanitary Engineering
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, Indiana 46206

Re: Miles Laboratories, Inc.

Dear Mrs. Menze:

As you will recall, Miles has previously filed a letter with your office, requesting permission for the alternative use of two parcels of land for the disposal of calcium sulfate only. Application was made to the City of Elkhart Health and Sanitation Commission for a permit for this purpose.

Pursuant to our previous conversations on this subject, enclosed please find a copy of the permit which was granted at the January 24, 1975 meeting of the Health and Sanitation Commission. Also, enclosed please find a copy of a previous letter issued by the planning director for the City of Elkhart.

This letter will also confirm our meeting of February 11, 1975, at 1 p.m. to discuss this matter.

If you have any further questions or needed any additional assistance, please call on me.

Very truly yours,

Franklin E. Breckenridge

FEB/pc
cc:C. L. Whistler

CITY OF ELKHART, INDIANA

PLAN COMMISSION

DANIEL E. HAYES
Mayor

MITCH SEVER, A.I.P.
Director

November 27, 1974

TO WHOM IT MAY CONCERN:

Property is presently zoned M 1, and in our preliminary investigation of the Zoning Ordinance the property could be used for a landfill operation if it met all other applicable requirements; however, sanitary landfills are not permitted in M-1.

Mitch Sever,
Director

vl

April 22, 1975

Miles Laboratories, Inc.
1127 Myrtle Street
Elkhart, Indiana 46514

Gentlemen:

Re: Issuance of Construction Plan Permit
for Miles Experimental Industrial
Landfill, Elkhart County

You are hereby notified that the Stream Pollution Control Board of the State of Indiana has, this 22nd day of April, 1975, approved the plans and specifications for the above-referenced industrial landfill project which contains approximately 30 acres located within the SE $\frac{1}{4}$, SW $\frac{1}{4}$, of Section 25, T.38N., R.4E., Elkhart County.

The trench method of sanitary landfill operation is proposed. The maximum depth of excavation will be four feet. The calcium sulfate will be compacted in 6-inch layers to a total thickness of 3 feet. A weekly cover of six inches of soil will be applied.

You are hereby issued construction plan permit number SW 169 for the subject site with the following conditions:

1. That only calcium sulfate be deposited at this site.

2. That at no time may calcium sulfate be deposited into water.

3. That monitoring wells be installed and tested on a quarterly basis as described in the plans and specifications submitted on March 12, 1975 (copy enclosed).

4. That in the event any of the monitoring wells do show an appreciable increase of calcium or sulfate levels approaching Public Health Service Drinking Water Standards, Miles Laboratories, Inc., will cease disposal operations and undertake corrective action.

5. That a mixture of sand and topsoil may be used as weekly cover, with the final cover to consist of at least two feet of clay soil.

Very truly yours,

Oral H. Hert
Technical Secretary

JRBaker/mjh
Approval No. SW 169
cc: Elkhart County Health Department
Elkhart County Plan Commission

June 11, 1976

Mr. E. E. Hartgerink
Miles Laboratories, Inc.
Environmental Control Division
Elkhart, Indiana 46514

Dear Mr. Hartgerink:

Re: Pharmaceutical Waste Disposal
Elkhart County

This will confirm your telephone conversation of June 7, 1976, with George Oliver of this office concerning the identification of pharmaceutical wastes currently being landfilled. As discussed, by requesting a qualitative and quantitative analysis, we are interested in the names of the chemical compounds and quantities of each. With this information we will be able to evaluate the inherent dangers involved in their handling and disposal.

Although this office did not specifically grant additional time, we will agree to a time extension of an additional 20 days.

We hope this will clarify our request for the pharmaceutical information. If you have any questions contact the Solid Waste Management Section at AC 317/633-6400.

Very truly yours,

David D. Lamm, Acting Chief
Solid Waste Management Section
Division of Sanitary Engineering

GO/mb
cc: Mr. Charles Himes
Elkhart County Health Department
Elkhart County Commissioners

October 7, 1976

Mr. Richard Herron
301 W. Franklin
Elkhart, Ind. 46514

Dear Mr. Herron:

Enclosed you will find a report of my findings to date on case of Himco Landfill and Associates correspondence.

As you can see, this report covers many analyses which, in my opinion, fix the well pollution as originating from the landfill. I was not able to specifically find citric acid in the samples. This would not be likely to be found as this item is washed at the plant. I do believe that enough evidence exists to affirm that constituents that originate at Miles Laboratories have found their way into water supplies.

I believe a list of what is hauled out of the companies by the scavenger would be helpful.

After you have read this report, I would like to discuss its significance with you to decide on the future course.

Sincerely,

Gilbert D. Elenbogen
8909 Kilpatrick Ave.
Skokie, IL. 60076

On September 17, 1976, I obtained water samples from the wells of Rumsfeld, Wiesman and Kolanowski located at Elkhart Ind. During my visit to these residences, I observed the landfill area operated by Himco Landfill Co. It is understood that the landfill had been a marsh, and was covered with approximately 15 ft. of fill. The soil appeared to be sand, and examination of the well surveys indicated that the land is sand and gravel at the levels under concern.

General observations of the landfill indicated that a white powder was being plowed into the fill (later found to be calcium sulfate). The powder was estimated to be about 250 ft. to the Wiesman well and about 75 feet from the Rumsfeld property line.

Several items sighted on the landfill are products that are produced or raw materials used at local companies or institutions. These included:

Nair - Whitehall Pharmacy	Hematest #146 1048056
A copper test solution	50 cc plastic syringe
Primatene	Preparation H
Dristan	enema bags
Sudden Beauty	Clinitest (Ames)
Bactine	

The condition of the fill was such that surface water run-off occurred in the direction of the residences in question. A sample of run-off water was taken from a fissure approximately 8" across and several inches deep. Samples were taken from homes in question, including present and past water supplies. Samples were taken after running pumps for 15 minutes. The samples were collected in clean liter bottles for chemical analysis, 250 cc. plastic bottles for metals and in clean sterile bottles for bacteriological analysis. The samples were placed in a cooled ice chest and kept at refrigerated temperatures prior to analysis.

Samples taken were as follows:

1. Rumsfeld well 25 ft.
2. Wiesman well 40 ft.
3. Wiesman kitchen 180 ft. (approx.)
4. Kolanowski 25 ft.
5. Run-off from landfill
6. City water
7. Rumsfeld 60 ft.

The appearance of the water from wells 1, 2, and 7 ranged from tan to dark brown All contained sediment. The sample from the Wiesman well (sample 2) collected in a 3 gal. container,formed an oily scum after settling for 15 minutes.

An examination of the homes of Rumsfeld, Wiesman and Kolanowski revealed excessive corrosion in utilities that come in contact with water. Corrosion of shower stalls, sinks, clothes washers and humidifiers was obvious. A reddish material occupying 3-4 liters in volume was settled on the bottom of the Kolanowski humidifier. This material was found to be largely iron salt.

The corrosive condition did not appear in other facilities using Elkhart, Ind. water.

Analysis of the samples appears in Table I (attached).

1. The results of the table indicate that Ca, Mg, iron, organic matter as indicated by COD, organic N, TVS, appear in the shallow wells in unnatural amounts. The amounts of these materials would not occur from the natural water table as indicated by deeper wells and other local water sources, but are a result of contaminants.

   The COD in well 2 is 5x that of raw sewage. The organic N and volatile solids also indicate an organic contamination.

2. Constituents found in the run-off sample are found in the wells (samples 2-4 (6) and, inf act, the concentration of these constituents in the well (COD, Fe, Ca, Mg) are a function of the concentration in the run-off sample.

3. Constituents in the run-off sample of the landfill are constituents that are hauled to the landfill - Ca from calcium sulfate, Mg, Fe, and organic matter. The correlation of the run-off and well analysis indicate that constituents in the run-off enter the wells.

4. While it would be apparent that many of the items in the landfill would occur in low concentrations in the wells and make analysis difficult and expensive, it can be assumed and concluded that as long as any constituent placed on the fill appears in the run-off and wells, then any other item that is placed in the landfill can also appear in the wells. The amounts of any material that enter the well from the landfill will be a function of its concentration and solubility.

Materials found in wells that can be shown to have originated from the landfill are also products used or produced by some local company.

a. Calcium sulfate, for example, is a by-product of citric acid production. In this process, the Ca salt citric acid is produced, which in turn is neutralized with sulfuric acid. This is found in the fill and wells.

b. Iron salts are often used in the citric acid process to stop fermentation. Large amounts of iron are found in the run-off and wells.

c. Magnesium salts are used or produced by Whitehall Pharmaceutical Co. This is found in excessive amounts in run-off and wells.

d. The organic matter in the concentrations found could likely

be a result of the fermentation broth,and a carbohydrate test was positive and could well be from the dextrose and fermentation.

e. The coliforms found, while not extremely high, would not be unexpected with the condition of the landfill. Such coliforms might be expected to originate from such materials as used enema bags.

f. The biological oxygen demand (BOD) is high for well water, but low as compared to the COD. This would indicate a non-biodegradable material is present or a chemical toxic to the organisms acting upon the biological material.

In order to determine whether the discrepancy between the BOD and COD was a result of a substance toxic to the organisms or non-biodegradable organic matter, a portion of sample # 2 and #5 were added to raw sewage in 1% concentrations. That was the concentration used for the original BOD test. The BOD of the raw sewage samples were: 190 - 145 - 110. When 1% of sample #2 was added to these samples of raw sewage and 1% of sample #5 to the other set of raw sewage, in each case the BOD was found to be 0. Thus it could be established that a substance toxic to normal growth of organisms appears in the run-off and wells.

SUMMARY: In summary, the initial investigation indicates and could be accepted without a doubt to those versed in the science that:

a. Materials in the landfill have entered the water supplies of Rumsfeld, Wiesman and Kolanowski.

b. The physical damage to the plumbing is a result of , or at least has been accelerated by the contaminants in the water supply.

c. The quality of this water is of such poor quality that it is below effluent standards for treated sewage. The water is not only below drinking water standards, but could not be acceptable for use for primary contact water, i.e. swimming. This water would not support fish life. Evidence of a toxic substance in the water has been shown.

d. Constituents in the water could cause adverse physiological effects upon humans.

e. It can be stated that the products on the landfill which have contaminated water supplies are the same as those that have originated from several pharmaceutical companies, such as, Miles Laboratories and Whitehall Pharmaceutical Co. It can also be assumed by any scientist familiar with water engineering that any soluble item placed in the landfill in reasonable quantities will eventually enter the wells.

December 29, 1976

W. Richard Herron
301 West Franklin Street
Elkhart, Indiana

Dear Richard,

This letter is to confirm our decision that if a settlement cannot be reached in your meeting on January 4, 1977, at 11:00 a.m. our suit will be filed on Friday, January 7, 1977.

We feel we have given Whitehall Laboratories more than enough time to discuss settlement in this matter. If there are any fruther postponements in this meeting, suit will be filed without delay.

Very truly yours,

Warren S. Wiseman

Patricia A. Wiseman

Herman C. Rumfelt

Patricia C. Rumfelt

Patricia Rumfelt

James K. Kolanowski

Helen J. Kolanowski

tot sol → Fe

ANALYSIS mg/l

Sample	BOD	COD	Fe	Tot. Solids	Zn	[illegible]	[illegible]	[illegible]	Ni	[illegible]	Ca	[illegible]	Oil	[illegible]	[illegible]	O [illegible]	[illegible]	TS	[illegible]	[illegible]	[illegible]
Rumfelt 125 ft		18	4.6	4.7	.3	.01	0	C	0	0	91	37.3		0	0	0				90	0
Wiseman 240 ft	58	564	45.8	45.8	1.0	0	.7	.02	.2	.02	120	15.1	.6	9.0	1.2	7.8	0	3076	1639	30	0
Wiseman 318 ft	46	60	.4	.4	.3	0	0	0	.1	0	51	17.2		0	0	0				10	0
Kolan 425 ft	46	335	14.2	14.2	.8	0	.01	0	.2	.08	150	30.4		5.5	4.7	5	0			20	0
Runoff lagoon	0	7000	97.8	213	.3	.01	.03	.09	.02	0	356	195	1.45	290	240	50	0				
City water 6		--	1.4	2.6		0	0	0	0	0	35	9.3			0	0					
Rumfelt 760 ft		3												6.0	5.3	1.7				10	0

In letter to E.P.A. from Roland O Dowe he reports this is what is normal or good water

1976 A) COD 12,000.0

B) Sulfates 350.0 ppm

C) total chromium 6.0 ppm

W. RICHARD HERRON
ATTORNEY AT LAW
301 WEST FRANKLIN STREET
ELKHART, INDIANA 46514
TELEPHONE 294-1516
AREA CODE 2 6

August 2, 1976

Thornburg, McGill, Deahl,
Harman, Carey & Murray
Attorneys at Law
305 First National Bank Bldg.
Elkhart, Indiana 46514

Attention: Mr. John R. Harman

In Re: Wiseman & Rumfelt - Elkhart General Hospital

Dear John:

Thank you for your letter of July 30, 1976, advocating the position that Himco is an independent contractor, disposing of waste products of Elkhart General Hospital, relieves Elkhart General Hospital of any responsibility to my clients. I must disagree with your position, and would refer you to the findings of the following cases: Scott Construction Company vs. Cobb (Ind. 1928) 159 NE 736; Stewart vs. Huff (Ind. 1936) 14 NE 2d 322; Danneau vs. Indiana & Michigan Electric Company (Ind. 1971) 277 NE 2d 8; Hale vs. Peabody Coal Company, (Ind. 1976) 343 NE 2d 310; Shannon vs. Missouri Valley Limestone Company (1963) 122 NW 2d 278.

I believe you will find that these cases state that one who employs an independent contractor to do work is liable for the acts of such contractor where the work will create a nuisance. I believe that under the circumstances in this case, the hospital was disposing of dangerous hazardous waste, was familiar with where it was being dumped, and consequently is responsible.

Elkhart General Hospital will be considered a primary defendant in this case, and jointly liable with all other persons, in causing or maintaining the nuisance in question.

If you would like to discuss this matter further, will you please call me.

Thank you for your consideration.

Very truly yours,

W. Richard Herron

WRH/plg
cc: Herman Rumfelt
Warren Wiseman

STATE OF INDIANA

STATE BOARD OF HEALTH

AN EQUAL OPPORTUNITY EMPLOYER

INDIANAPOLIS

Address Reply to:
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, IN 46206

January 14, 1977

this was my note to me

Mr. Herman Rumfelt
R. R. 6, Box 377
28369-C.R. 10 West
Elkhart, Indiana 46514

Dear Mr. Rumfelt:

Re: Pharmaceutical Waste Investigation
Elkhart County

We wish to inform you that we have completed our investigation concerning the (types and quantities of pharmaceutical wastes deposited) at the Himco disposal site on C.R. 10 and the Nappanee by-pass.

The review by our staff, of the (information submitted) has concluded that these wastes should not be considered toxic or hazardous for landfill disposal in the quantities indicated.

If there are any questions, please feel free to contact this office.

Very truly yours,

David D. Lamm, Acting Chief
Solid Waste Management Section
Division of Sanitary Engineering

Rucker told me the GO means i.e. Al Oliver wrote this letter Lamm approved it A.O signed it

GO/sjk
cc: Elkhart County Health Department
Elkhart County Commissioners

I know they didn't tell all because I know what we saw we took pictures and picked it up Gave to the loyer

Patricia Rumfelt note

Copy this today

1976 D Lamm
he use to inspect landfill
18-

1976 18-8
MAY 21
1976

May 21, 1975

[illegible], Mr.
[illegible], Inc.
[illegible] Wildwood Avenue
[illegible], Indiana 46514

Dear Mr. [illegible]:

Re: Disposal of Medical Waste
Mines Waste-Away Inc.
Elkhart County

Recent inspections of your disposal site have revealed that you are [illegible] Mines Waste-Away Inc. and Whitehall Laboratories. These chemicals need to be identified and approved if their land disposal is to be continued.

A detailed description of the chemical compounds is necessary. This description must contain a quantitative and qualitative analysis of all the chemicals you wish to dispose of in the landfill.

Please submit the above information within 15 days from receipt of this notice. The information will be reviewed to determine the potential hazards involved and special disposal criteria established if necessary.

Very truly yours,

David D. Lamm, Acting Chief
Solid Waste Management Section
Division of Sanitary Engineering
AC 317/633-6400

CC/[illegible]
cc: [illegible] Laboratories
Whitehall Laboratory
Elkhart County Health Department
Elkhart County Commissioners

REFERENCE 17
SITE NAME Himco Dump
SITE ID IND 980 [illegible] 17

April 5, 1977

TO: Hon. Otis R. Bowen, M. D.
Governor, State of Indiana

FROM: William T. Paynter, M. D.
State Health Commissioner

SUBJECT: Response to Mrs. Patricia Rumsfelt's Letter of March 1, 1977

The staff of the Solid Waste Management Section has expended considerable time and effort investigating the complaints and sampling surface and groundwater in the area of the Himco Disposal site. We believe that the best response we can make is to cite a brief history of the situation.

1. The open dump was initially identified on August 24, 1971. General refuse and pharmaceutical wastes (aspirin, Ba[illegible]ine) were deposited in a swampy area northwest of the intersection of County Road 10 and the Nappanee bypass.

2. Several inspections were conducted in 1971 through 1974 to bring the site into compliance with current standards.

3. On April 18, 1974, a representative took water samples of surface water as well as five of six residential wells adjacent to the landfill. The wells are said to be shallow driven wells ranging from 62 feet to 22 feet in depth. No reference was made of the sanitary construction of these wells prior to sampling.

4. On April 26, 1974, we received letters from Mrs. Rumsfelt and three other individuals concerning odorous, cloudy water in their private wells. This was confirmed to be true.

5. Before the water sample testing was completed, our office recommended that Mr. Charles Himes, the owner and operator of the disposal site, provide additional wells for the six affected residents.

6. Water sample results from the April 18, 1974, sampling show the shallow wells to be high in chemical oxygen demand and manganese. Surface water was shown to be grossly contaminated.

7. On November 14, 1974, three additional wells were sampled which were located within one-quarter mile from the site. They were found to be high in manganese (.60 ppm) content.

8. Within a two-week period between May 2, 1974, and May 14, 1974, Mr. Himes had wells drilled for the six residents adjacent to the landfill:

   a. Warren Wiseman - R.R. #6, Box 379, C.R. #10
   b. Ansel H. Elwell - R.R. #6, Box 378, C.R. #10
   c. Robert B. Whitmer - R.R. #6, Box 380, C.R. #10
   d. Herman Rumsfelt - R.R. #6, Box 377, C.R. #10
   e. Noble L. Bowers - R.R. #6, Box 382, C.R. #10
   f. James K. Kolanoski - R.R. #6, Box 381, C.R. #10

   These wells were all 152 feet deep or better through a clay barrier which should isolate the n w aquifer. Two of these wells equalled or slightly exceeded the recommended public health service drinking water standard for iron (0.3 ppm and 0.7 ppm).

9. Due to the poor geological characteristics, on July 2, 1974, our office requested that the site cease operation by December 31, 1974. This was later extended to March 1, 1975, at which time only inert materials and calcium sulfate would be deposited.

10. On February 18, 1975, a consent agreement was signed by Mr. Charles Himes, and adopted by the Stream Pollution Control Board. By September 25, 1975, a new landfill was to have been established and the old one closed.

11. Water samples of the deep wells were again taken on May 16, 1975, and all six samples were satisfactory.

12. Our Hearing Commissioner advised us that the Consent Order could be verbally extended until December 1, 1975. Mr. Himes was notified of this decision. The operation was allowed to continue until September 27, 1976, pending zoning appeal and new site preparations.

13. On October 25, 1976, we received a copy of private well water sample results from the six shallow wells of the above individuals. Only Warren Wiseman's new deep well was sampled. The results were satisfactory as in the previous testing.

14. An inspection on September 17, 1976, revealed that refuse is no longer deposited at this site. Final cover (two feet), grading, and seeding, had not been completed.

Summary:

We agree with Mrs. Rumsfelt in that the shallow well water is objectionable to drink. This opinion is based primarily upon the off color and the odor of the well water. Chemical samples indicate a high COD and manganese content. As a result, Himco, Inc., provided deep wells for these individuals which now supply safe water to their homes. A sample of one deep well was supplied to us on October 21, 1976, which indicates that the water is still satisfactory. The Rumsfelts, the Wisemans, the Kolanoskis are now suing Himco, Inc., and several other individuals to recover previous damages. Their requests for water samples may be for use as court evidence in proving their allegations of leachate contamination.

The City of Elkhart has requested that the U.S. Geological Survey conduct an extensive ground water sampling program at two locations within the county. They are concerned whether the Himco Disposal and an industrial disposal site in the eastern area of the county are causing groundwater contamination and, if so, how will they affect the municipal well. The U.S. Geological Survey is scheduled to undertake this project in the spring.

Attachment

Letter from Patricia C Rumfelt
283-69-R 10 W
Elkhart, Indiana

Dear Mr Eckhardt **please Help us**

We have ground water contamination in Elkhart Indiana in Cleveland township on Fortwayne Road and going ~~South~~ for almost a mile a large area many people are useing this bad water some know about it some don't

I was the Elkhart Water Quality person working with the Michiana Council of Government on water problems & am one of the families whose well is contaminated. living in hell

[left margin:] ...cials our Health dept our State ...oard of Health Everybody is afraid of Industries in this town Help

National Priorities List

Superfund hazardous waste site listed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended in 1986

HIMCO, INC., DUMP
Elkhart, Indiana

The Himco, Inc., Dump covers approximately 40 acres at County Road 10 and the Napanee Extension in the Town of Elkhart, Elkhart County, Indiana. The privately owned site operated between 1960 and September 1976. A marshy area was excavated to a depth of 10 to 20 feet, and general refuse and medical and pharmaceutical wastes were buried in the resulting hole. Industrial waste may also have been landfilled, according to the company and a report prepared by the Indiana Department of Natural Resources and the Elkhart Water Works. The owner stated that in the mid-1960s he received a permit from the city to accept municipal waste from northwest Elkhart County.

During an inspection in July 1984, EPA observed several streams of leachate. The landfill was about 15 feet above the original ground level at the center, sloping to 5 feet at the edges. Much of the landfill was covered with sand. Isolated spots of stressed vegetation were visible. Sulfur odors were strong.

EPA detected cobalt, selenium, beryllium, cadmium, copper, manganese, and other metals in monitoring wells downgradient of the site. The results corroborated analyses of residential wells conducted in 1974 by the State, which showed high manganese levels.

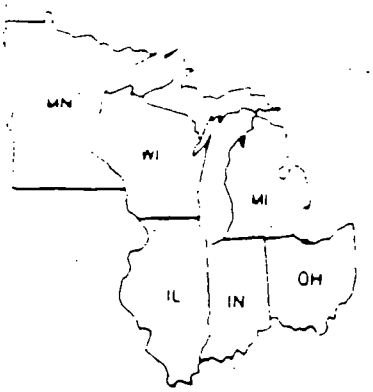
In 1974, the State Health Commissioner advised the owner to drill deep wells to replace six contaminated shallow residential wells. In 1975, the owner signed a Consent Agreement (adopted by the Stream Pollution Control Board) that resulted in the closing of the dump in September 1976.

The dump is located above a continuous portion of the shallow aquifer system that is the sole source of drinking water for the community. A conservative estimate is that wells within 3 miles of the site serving 20,000 people may be affected.

A 1980 hydrogeologic study of the area by the U.S. Geological Survey led EPA to install two interceptor wells to divert contaminated ground water away from Elkhart's North Main Street Well Field approximately 1.5 miles southeast of the site. The interceptor wells have permits under the National Pollutant Discharge Elimination System to discharge into nearby Christiana Creek.

United States Environmental Protection Agency
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604

EPA



Superfund Division

Facsimile Cover Sheet
Telephone Number
312-886-4071

To: M. Chesslin

Office phone: 202-514-1491 Machine No: 202-616-6584
DOJ

From: G. Massenburg

Office phone: 312-886-0983 Mail code: SR-6J

Date: 1/5/05 Number of pages, including cover: 24

Message: Mimi, This is the information Jessica shared from the ISBH Bib. list. I will send a second fax of 24 pages. I will also share this with L. Johnson, of course.

Thanks
Gwen

Signature:

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
100 NORTH SENATE AVENUE
P.O. BOX 6015
INDIANAPOLIS, INDIANA 46206-6015

Date: 1/5/05	Fax #: 312-886-4071
Company/Division:	Telephone #:
To: Gwen Massenburg	

From: Jessica Fliss	Telephone #: Fax #:
Office/Branch/Section:	Number of Pages (including cover): 23

Comments:
I'm sending these in Batches.
This is Each #1

IDEM Location	Indiana Government Center North	Fax Number Area Code (317)	Confirm Number Area Code (317)
Commissioner's Office		233-6647	232-8162
Enforcement		233-5968	233-5529
Land Quality		232-3403	232-4473
Land Quality		234-0428	233-2570
Water Quality		233-5968	233-5529
Air Quality		232-8406	232-8670
Legal Counsel		233-5967	233-0178
Media & Communications		233-5517	232-8753
Office of Mgmt., Budget, & Admin.		232-8564	232-8560
Information Technology		232-5539	232-8180
Purchasing		233-6276	232-0764
Office of Pollution Prevention		233-5627	233-5434
	Western Select Properties	Area Code (317)	Area Code (317)
Drinking Water		308-3339	308-3280
Water-Assessment		308-3219	308-3176
Water-Drinking Water Compliance		308-3340	308-3282
Air Quality		308-3239	308-3236
Land Quality Compliance Branch		308-3063	308-3017
	Regional Offices		
Northwest Office	Merrillville, IN	(219) 757-0267	(219) 757-0265
North Central Office	South Bend, IN	(574) 245-4877	(574) 245-4870
Southwest Office	Petersburg, IN	(812) 380-2304	(812) 380-2305

Summary
Final Proposal
Industrial Landfill Operation

Miles Experimental Industrial Landfill
Elkhart County

Description: Miles Laboratories, Inc., of Elkhart, is proposing to operate an industrial disposal operation for the disposal of calcium sulfate only. The site is located within the SE $\frac{1}{4}$, SW $\frac{1}{4}$, of Section 25, T38N., R4E., Elkhart County. The operation will be conducted on an experimental basis beginning with Parcel I which contains approximately 30 acres. The disposal of calcium sulfate will take place only as an alternative in the event the Himco Landfill or other approved disposal method is unavailable. The Miles plant has the need for disposal of 320 cubic yards of calcium sulfate per day. The site has proper zoning from the City of Elkhart.

Owner: Miles Laboratories, Inc.

Operating Procedures: The trench method of sanitary landfill operation is proposed. The maximum depth of excavation will be 4 feet. The calcium sulfate will be compacted in 6-inch layers to the total thickness of 3 feet. A weekly cover of six inches of soil will be applied. A final cover of one foot of soil will be applied.

Recommendations: It is recommended that the Board grant construction plan permit number SW 169 for the proposed experimental industrial landfill with the following conditions:

1. That only calcium sulfate be deposited at this site.

2. That at no time may calcium sulfate be deposited into water.

3. That monitoring wells be installed and tested on a quarterly basis as described in the plans and specifications submitted on March 12, 1975 (copy enclosed).

4. That in the event any of the monitoring wells do show an appreciable increase of calcium or sulfate levels approaching Public Health Service Drinking Standards, Miles Laboratories, Inc. will cease disposal operations and undertake corrective action.

5. That a [redacted] and topsoil may be used as weekly cover, with the [redacted] cover to consist of at least two feet of clay soil.

JRBaker/mc
4/15/75

January 6, 1975

VIA CERTIFIED MAIL

Earl W. Yeagley, Jr.
Associate General Counsel and
Assistant Secretary
Miles Laboratories, Inc.
Elkhart, Indiana 46514

Dear Mr. Yeagley:

Re: Classification of Calcium Sulfate

This is in response to your letter of December 9, 1974, in which a request was made for exclusion from Regulation SPC 18 for the calcium sulfate generated by your operation.

We have reviewed both the information received in written form and that which was relayed through conversations with various representatives of Miles Laboratories, Inc. This also includes the latest laboratory results as submitted on December 20, 1974, by Mr. Paul D. Francis, Manager, Process and Quality Control, Citric Manufacturing of Miles Laboratories, Inc. In addition, we have consulted with members of the laboratory staff at the State Board of Health.

It is our determination that the calcium sulfate as generated from your citric acid process cannot be excluded from Regulation SPC 18 under Chapter IX, Section 1. This decision is also based in part on information which was included in your report on the properties of calcium sulfate as received on December 9, 1974, by our office.

The solubility of calcium sulfate varies appreciably with changes in pH and other electrolytic conditions to which it is exposed. The solubility is known to increase substantially under acidic conditions which are often similar to those found in leachate generated from landfill operations which dispose of degradable wastes. Although the leachate generated from the calcium sulfate alone may not be defined as having a toxic effect on a groundwater supply, it may seriously alter the natural mineral properties of that water supply. Therefore, it is essential that care be taken to assure that the calcium sulfate is not exposed to conditions which would increase its solubility.

It is feasible, however, to consider this material to be stable if kept near neutral p H . This would include separate disposal from organic wastes. Under these conditions, the calcium sulfate should be least soluble.

Conditions relative to disposal of calcium sulfate at the Himes site are:

1. Disposal in dry areas only.

2. Separate disposal from decomposable materials.

3. Protection from extremes of pH caused by natural or manmade sources.

If you have any questions, please refer them to the Solid Waste Management Section at AC 317/633-4393.

Very truly yours,

Roland P. Dove, Acting Director
Division of Sanitary Engineering
AC 317/633-4330

CAM/mc
cc: Franklin E. Breckinridge, Attorney
Mr. P. D. Francis, Manager
Process-Quality Control

Earl W. Yeagley, Jr.
Associate General Counsel
and Assistant Secretary
Miles Laboratories, Inc.
Elkhart, Indiana
219-264-8395

December 9, 1974

Mr. Roland Dove
Stream Pollution Control Board
1331 West Michigan Street
Indianapolis, Indiana

Re: Himco Waste-A-Way Service, Inc.

Dear Mr. Dove:

Miles Laboratories, Inc., an Indiana, corporation located at 1127 Myrtle Street, Elkhart, Indiana joins in the request of Himco Waste-A-Way Service, Inc., for an extension of time to December 31, 1975, within which to discontinue its existing sanitary landfill at County Road 10 in Elkhart County, Indiana.

There are a number of facts and circumstances respecting this matter which, we believe, will demonstrate that the continued, and proper, operation of this landfill for an interim period of up to an additional year is in the best interests of the Elkhart community, including Miles Laboratories, and will not pose any potential threat to the health or environment in the area.

There are only two landfill operators of any significant capacity in the Elkhart community. Those are the Elkhart County and Himco landfills. Of the two, Himco handles a substantially greater volume of waste than does the County. Quite naturally, the County does not have excess or surplus equipment standing idly by to handle a sudden surge in demand. We have been advised by the Superintendent of the County landfill that, if he were to attempt to handle the additional volume now

disposed of at the Himco fill, six (6) months would be required to procure the necessary equipment and to attain the capability to do so. We are further advised that the main County fill site presently has only about two (2) years of remaining capacity at its existing site. A vast increase in its inflow obviously would force the County to use up its capacity and move to another site at a much earlier date than presently anticipated.

Quite apart from those limitations, there are other limitations respecting hours of operation of the County landfill that would inflict an impossible burden on various industrial operators, particularly Miles, if they were to attempt to conform to those hours. The County landfill is open only five (5) days a week and its hours are 8:00 A.M. to 5:00 P.M. (We are advised that these restricted hours were agreed to by the County in connection with settlement of litigation by neighbors who had opposed the initial location of the landfill in their neighborhood.)

Miles, which employs approximately 2,500 employees in Elkhart, operates seven (7) days a week, 24 hours a day. Miles is the world's second largest producer of citric acid. Citric acid is utilized world wide, is an important food ingredient, and is used very heavily in the pharmaceutical industry. Calcium Sulphate is a by-product resulting from the process of manufacturing citric acid. As such, the calcium sulphate must be disposed of continually, as a part of the continuous operations of the citric acid plant. It normally is, and at the present time is, produced in the amount of 20 tubs, or 320 cubic yards, per day.

The physical design of the Miles plant provides a carousel arrangement of nine (9) rotating tubs, each with a capacity of 16 cubic yards. Thus, it is apparent that the maximum time required to fill all tubs, without having disposal service, is only about ten (10) hours. Miles must have both continuous availability of a place to dispose of the calcium sulphate

and haul-away service available for at least 14 hours each day, all seven (7) days of the week. Thus, you will appreciate that, for Miles, the County landfill - with hours of only 8 to 5, five (5) days a week - simply is not a viable alternative, consistent with keeping its citric acid plant in operation.

It is quite important, of course, to recognize the characteristics of calcium sulphate. Calcium sulphate occurs, commonly, in nature. The "White Cliffs of Dover" are a form of calcium sulphate, as are large dunes in Texas and New Mexico, gypsum and many other things. The calcium sulphate produced by Miles is non-toxic and inert.

We note that SPCB Regulation 18 provides that "disposal sites and operations which receive only rocks, brick, concrete or earth," are excluded from the provision of that Regulation and, further, that other substances may be recognized also to be inert, under that Regulation. We request that calcium sulphate produced by Miles be so recognized and classified under the Regulations. In support thereof, we attach documents showing: I. The various forms of calcium sulphate; II. Common definitions; III. Occurrences and properties; IV. Uses; V. The National Formulary specifications for food grade materials; VI. Chemical analysis and; VII. Leaching studies on calcium sulphate.

This data will, we believe, demonstrate that the calcium sulphate should be recognized as inert and, further, that the very substantial volume of calcium sulphate is both an acceptable and desirable addition to the wastes in the Himco landfill.

As you know, the overwhelming majority of the wastes received by Himco consists of lumber, sawdust and other wastes from industrial and commercial enterprises.

The operation has been highly responsible; there are no vectors or odors evident; and the premises are orderly. Mr. Himes, with the support of Miles, has responded well to legitimate concerns of the area in the past and we know of no present community criticism of his operations. While it may be recognized that this site might not be chosen for a new general purpose landfill using present day standards, it is a fact that this landfill has been in operation for fourteen (14) years. It is also pertinent that there is only about one year of capacity remaining at this landfill - at which time it must be discontinued in any event and a new site must be operable.

Mr. Himes has been endeavoring to acquire a new site for relocation of his landfill operations. Assuming that he succeeds in that endeavor within a reasonable time, he then must process the matter through local zoning procedures, accumulate the data for filing and processing a request for construction and operating permits through your office and accomplish the construction steps which are a pre-requisite to commencing operations at the new site. It would appear to be wholly realistic to anticipate that completion of these steps may, with all due diligence, reasonably consume all or most of a year's time.

We are confident that Himco can and will operate its landfill in a manner not detrimental to the Elkhart community. Permitting Himco's landfill to continue to operate until December 31, 1975 - while a replacement site is readied - will avoid the harsh and, we believe, unwarranted economic consequences that a closing would impose upon Himco, and upon Miles. We sincerely believe that the interests of Himco's many other industrial and local customers, and the interests of the entire community, would be substantially injured by a failure to allow time for an orderly transition, free of sharp disruptions.

You may be certain that Miles has a clear appreciation of the responsibilities and objectives of your office and would not request forbearance in this matter if it believed that any health hazard were imminent. Under the circumstances, it appears to Miles that the legitimate interests of your office and of Himco, Miles and the Elkhart community can all be reconciled and served by the continued and reasonable operations of the landfill for another year. We urgently request your approval of that course of action.

MILES LABORATORIES, INC.

By Earl W Kingsbury Jr

4661-4667

(HIMCO DUMP)

INDIANA STATE BOARD OF HEALTH
BUREAU OF LABORATORIES + WATER LABORATORY
~~INDUSTRIAL WASTE~~ SEWAGE ANALYSES 169

Source ELKHART Co

Date Received NOV 15 1974

Collected by MENZE-DAYHOFF #227

Reported on _____

Reported by _____

Temp. _____

Lab No. D	Station	Chemical Analysis in parts per million															
		BOD	pH	Alk.	Cl	TS	VTS	SS	VSS	Tot. PO_4	COD	SO4	SP. COND	Cd	MN	HEX CR.	
4661	(A) GOSS WELL	1.0	7.4		39.	320					9.0		560	<0.01	0.60		
4662	(B) FRANKS WELL	<1.0	7.2		2.	140					<1.0		510.	<0.01	0.11		
4663	(C) MASE CO. WELL	<1.0	7.5		13.	140					3.0		340	<0.01	0.16		
							No Wate										

CALCIUM SULFATE

I. Forms

Combinations of calcium, sulfates, and water exist in several various forms:(1)

1. Anhydrous Calcium Sulfate ($CaSO_4$)

   The natural form of anhydrous calcium sulfate is known as the mineral anhydrite (karstenite, muriacite, anhydrous sulfate of lime, anhydrous gypsum).

2. Insoluble anhydrite (dead-burned gypsum) ($CaSO_4$)

   Has the same crystal structure as anhydrous calcium sulfate, but is obtained upon complete dehydration of gypsum at above.

3. Soluble anhydrite ($CaSO_4$)

   Has the same crystal structure as anhydrous calcium sulfate, but is obtained by complete dehydration of gypsum at below 300°C in an electric oven.

4. Hemehydrate ($CaSO4 \cdot 1/2\ H_2O$) (dried calcium sulfate, plaster of paris, annelin, dried gypsum.

   Formed by the addition of 6.6% H_2O to the soluble anhydrite through absorption.

5. Dihydrate ($CaSO_4 \cdot 2\ H_2O$) (native calcium sulfate, precipitated calcium sulfate, gypsum, alabaster, selenite, terra alba, solenite, mineral white, satin spar, light spar.)

Calcium sulfate is said to be actually capable of existence in at least nine different forms - two forms of the dihydrate ($CaSO_4 \cdot 2H_2O$); three forms of the hemehydrate ($CaSO_4 \cdot 1/2\ H_2O$); and four forms of the anhydrous salt ($CaSO_4$).(2)

II. Common Definitions

Websters Collegiate Dictionary: 5th Edition: Gypsum: Mineral. Hydrous calcium sulphate, $CaSO_4 \cdot 2H_2O$.H, 2. Sp. Gr., 2.31-2.32. Gypsum is used as a dressing for soils, for making plaster of paris, etc. -V.T. to treat with gypsum, as soil or water.

Food Chemicals Codex: 1st Edition: Calcium Sulfate ($CaSO_4 \cdot 2H_2O$): a fine, white to slightly yellow-white, odorless powder. It is slightly soluble in water, but dissolves in dilute hydrochloric acid solutions.

The Condensed Chemical Dictionary - Fifth Edition

Terra alba $CaSO_4 \cdot 2H_2O$ Finely pulverized powder made from gypsum and used in the manufacture of paper, paints, artifical marble, and composition plastics.

Gypsum $CaSO_4 \cdot 2H_2O$. A natural hydrated calcium sulfate.

The National Formulary: Thirteen Edition - Calcium sulfate occurs as a fine, white to slightly yellow - white, odorless powder.

III. Occurrence, And Properties

Gypsum. This material properly defined, is the natural mineral of calcium sulfate dihydrate, $CaSO_4 \cdot 2H_2O$-sp gr, 2.31-2.33; Mohs hardness, 1.5-2. It is widely and abundantly distributed in nature and occurs in an interesting variety of forms, conditions, associations, and colors. In pure form, gypsum is snow-white and occurs in stratified layers, doubtless of marine origin. Either because of varying conditions at the time of precipitation or through recrystallization, the mineral occurs in various conditions from hard, solid rock to fragmentary and granular forms. In some deposits the rock occurs in easily friable masses of coarsely crystalline beds, which are appropriately called "sugar rock." Many deposits yield the massive mineral through the body of which occur crystals of selenite (see below), these deposits being described as selenitic gypsum. Most deposits of gypsum occur closely associated with either strata or random occurrences of the mineral anhydrite, suggesting a question of the geological origin and the possible transformation of one form into the other after deposition.

Gypsum is widely distributed over the earth and is commercially available in quantity in most industrial nations. More than one-third of the states in the U.S. have abundant resources, as reported in the Minerals Yearbook.

The mineral occurs normally in horizontal strata or veins varying from a few inches to many feet in thickness. Open-pit or strip mining is employed for deposits near the surface; both slope and shaft mines are common for deeper deposits. The importance of the mineral gypsum as a source of almost all commercial forms of calcium sulfate is shown by the fact that in 1962 there were approximately 68 gypsum plants in the U.S., distributed through 22 states and operating 16 underground mines, 54 open quarries, and a number of mine-quarry combinations.

Gypsum dissolves in water to the maximum solubility of approximately 2.1 g/liter at about 40°C and has the lower solubility of approximately 1.8 at 0°C and 1.9 in the range of 70-90°C. The concentration varies erratically with traces of electrolytes and variations in pH and, preferably, should be determined experimentally for all systems other than pure water solutions.

Alabaster. This is massive, densely crystalline, softly textured form of practically pure gypsum. It is usually translucent and frequently tinted with beautifully variegated colors due, probably, in some cases, to optical effects in the crystalline mass and, in other cases, to traces of foreign materials. Several deposi in Colorado supply practically all of the alabaster used in the U.S. These deposits furnish the mineral in white and a variety of attractive color tints and blends. The mineral is taken from the mines with care in moderate to large lumps.

Alabaster, being relatively soft yet dense and fine-textured, is easily worked by the carving knife and the saw, and may be readily shaped by abrasive papers and polished to a fine smooth finish. Much of the shaping and finishing of alabaster is done while the stone is kept wet. Alabaster has been known and used for the carving of cruses, urns, and other small vessels, and for the making of images, statuary, and other art objects. Many ancient structures have been embellished by columns, porticoes, and other decorative finishes of alabaster.

Selenite. It is a pure form of gypsum crystallized in the monoclinic system in the form of sheets or plates that show a perfect and easy cleavage parallel to the plane of crystallization. Sheets or slabs of selenite occur in sizes up to several feet in width and length, and these sheets, with characteristic oblique corners, break down in parallelograms of similar proportions. Selenite crystals up to several inches in thickness are completely transparent. Thin sheets of selenite polarize light and are used in laboratory equipment for this purpose. Selenite does not have the elastic return of mica and, when once distorted, remains so.

Satin Spar. This is another form of pure crystalline gypsum and is known as gypsum var. satin spar (not to be confused with calcite var. satin spar, $CaCO_3$). The crystals are monoclinic and in the form of parallel threads. A mass of satin spar, therefore, resembles somewhat the common forms of asbestos and, in many cases, the threads can be picked or raveled out of the mass. In the more densely formed growths, satin spar is translucent and lends itself readily to fabrication and polishing into trinkets and small art objects. Satin spar is formed in seams, sutures, and faults in or near gypsum deposits by the precipitation from, or the evaporation of, ground water carrying the mineral in solution. it is, accordingly, sometimes called secondary gypsum. Formations of satin spar are frequently observed in abandoned mines and in the joints of masonry through which gypsiferous water reaches the open air.

Anhydrite. The natural mineral form of anhydrous calcium sulfate is known as anhydrite; it has a sp gr of approximately 2.8-2.9, and a Mohs hardness of 3-3.5. It is usually densely massive and frequently shows light tints of color as blue, pink, etc. Anhydrite has the same solubility in water as gypsum but does not react rapidly to form hydrates. It is, accordingly, less valuable as a raw material when this property is desired. It can be used as a sulfate source for ammonium sulfate.

Gypsite. This is an earthy deposit at or near the surface of the ground and consists of finely crystalline gypsum mixed with loams, clays, sands, and humus; it ranges from 60 to more than 90% gypsum. These deposits are formed by the movement of ground water carrying gypsum in solution and the deposit of the mineral by evaporation at the surface, or as windblown "loesco" from disintegrating rock deposits. Surface beds or quarries of gypsite, chiefly in the southwestern states, have been worked in the production of plaster, structural tiles, etc, in the building industry but, in general, are at present of little commercial importance.

Gypsum Sands. Enormous deposits of practically pure gypsum in the form of fine, white sands occur at various points in Arizona, New Mexico, and Texas. These sands, covering many thousands of acres in some deposits, appear as drifts and dunes and are doubtless the result of evaporation of gypsum-bearing water rising to the surface of the earth through seepage springs or by uniform movement over wide areas of land. This is a natural result of the normal arid condition of the atmosphere in these regions. Practically without exception these deposits are contaminated with sodium sulfate to such an extent that they are valueless for structural of hydraulic purposes.(3)

IV. Uses

Gypsum, as such, has only a few major uses but these are important. In the manufacture of portland cement gypsum is a necessary ingredient and is used to lengthen the time of setting of various cements and mortars to allow for depositing and placing in forms. The "raw" gypsum is moved to the cement plants, usually in open cars, in the form of rock crushed to about 1.5 in. and finer. Automatic machines charge the crushed gypsum into the flow of cooled clinker in the amount of 3-5% as the mixture goes to the grinding mills.

In some foreign countries (as Germany), gypsum has been used as a source of lime, CaO, in the manufacture of portland cement. This involves the complete decomposition of the gypsum at the temperature of the cement kiln and then recovery of sulfur trioxide, SO_3, as a by-product.

An important large-scale use of gypsum is in the treatment of soils, particularly those used for leguminous crops and in the culture of peanuts. For this use the gypsum (or occasionally anhydrite) is finely ground and is known as "land plaster." Benjamin Franklin is credited with the introduction into the U.S. of this application as the result of his observations in France. Finely ground gypsum, when mixed with manures, acts to stabilize the volatile and dissolved nitrogenous compounds, thus preventing their loss by volatilization and leaching. A major use in arid climates is neutralization of "black alkali" soil by reaction with the alkali carbonates that cause this condition.

As a stable, nontoxic, tasteless, odorless, nonabrasive, practically chemically inert powder, known as terra alba, gypsum is used in paints, pharmaceuticals, paper filling, insecticide dusts, yeast manufacture, water treatment, and many other industries. In brewing, it may be added to the water to lower the pH of the mash.

Some Recent Developments in the Use of Gypsum. Low-grade nickel ore is subjected to sulfide smelting by the addition of coal and gypsum in a continuous reverberatory furnace operated at 1300°C. The ore is crushed to 10 mm size.

Calcium sulfate and coke are heated in an electric furnace to give calcium carbide, carbon dioxide, carbon monoxide, and sulfur. The proportion of anhydrite to coke is 1.4:0.6.

Sulfuric acid is prepared by heating gypsum at 1200°C to produce sulfur trioxide. The required temperature can be lowered to 1000°C by the addition of quartz and the velocity increased by the addition of sodium chloride and moist air. A yield of 99% SO_3 is reported.

Ammonium sulfate is produced from calcium sulfate by reacting it with ammonia, carbon dioxide, and water. Calcium carbonate is produced as a by-product.

Gypsum is added to opal or transparent soda-lime or soda-potash-lime glasses as a coloring agent. The combined sulfur is reduced by elemental silicon or aluminum to produce colors varying from ivory to amber.

Porous polytetrafluoroethylene (Teflon) is made by mixing an aqueous dispersion of the polymer with plaster of Paris, pouring the mixture into a mold, and heating it until the polymer fuses. The plaster of Paris is then dissolved out, leaving a porous molded product.

For proper gel formation of certain food products a source of calcium ions is required. Calcium salts used for this purpose include calcium citrate, calcium gluconate, calcium glycerophosphate, calcium hypophosphite, di- and tricalcium phosphates, and calcium sulfate.

Water used in the brewing industry is often "corrected" to a uniform mineral salt content that corresponds to water known to give the most satisfactory final product. A wide variety of salts are used for this purpose, including mono- and diammonium phosphate, calcium chloride, calcium hydroxide, calcium oxide, calcium dihydrogen phosphate, calcium sulfate, magnesium sulfate, potassium aluminum sulfate, potassium chloride, potassium sulfate, sodium bisulfate and mono-, di-, and trisodium phosphates. Some of these chemicals, in addition to standardizing the salt content, also control the acidity, thus providing uniform conditions for yeast fermentation.

Three basic types of gypsum (calcium sulfate) derivatives provide the dental industry with the basis for a variety of useful materials. The versatility and usefulness of gypsum depend upon the ease, character, and reversibility with which the water of crystallization, and the attendant crystal form, can be altered. Fundamentally, a partial dehydration from the dihydrate form, $CaSO_4 \cdot 2H_2O$, to the hemihydrate form, $CaSO_4 \cdot 0.5H_2O$, of calcium sulfate is achieved by heating. The mode of applying the heat, and the conditions under which the partial dehydration occurs, alter the physical characteristics of the resulting crystal and provide the three basic types of gypsum derivatives (plaster; Hydrocal (United States Gypsum Co.); Densite (CertainTeed Products Corp.); and low-consistency hydrocal). In use, the powdered calcium sulfate hemihydrate, $CaSO_4 \cdot 0.5H_2O$, which has been formulated into a useful product, is mixed with a prescribed quantity of water to form a slurry. The partially dehydrated calcium sulfate, $CaSO_4 \cdot 0.5H_2O$, will recombine with the mixing water, and recrystallize, to again form the dihydrate of calcium sulfate, $CaSO_4 \cdot 2H_2O$. The solution of the hemihydrate, followed by the recrystallization of the dihydrate, results in a crystalline growth which solidifies the entire mix into a structurally strong and useful mass.

The natural or unmodified hardening time for plaster of Paris is in the range of 5-120 min. However, this entire family of materials is subject to considerable modifications to adapt them for a variety of useful dental materials.

Many of the newer therapeutic agents are of extremely high potency, thereby requiring only fractions of a milligram per dose. In such cases, the tablet consists mainly of inert filler providing bulk so that a tablet of suitable size for ease of handling by the manufacturer, pharmacist, and patient can be manufactured. These fillers or excipients may be lactose, mannitol, sucrose, calcium sulfate, calcium phosphate, or microcrystalline cellulose. In addition, other agents such as binders (tragacanth, acacia, starch paste, methylcellulose, etc), disintegrants (corn starch, alginic acid, microcrystalline cellulose), and lubricants (stearic acid, magnesium stearate, calcium stearate, Carbowax, and talcum) are usually added to the tablet formulation.

Production of phosphoric acid by the wet process involves the steps of (1) dissolving phosphate rock in sulfuric acid, (2) holding the acidulate slurry until the calcium sulfate crystals grow to adequate size, (3) separating the acid and calcium sulfate by filtration, and (4) concentrating the acid to the desired level. The reaction for the process used most extensively is as follows:

$$Ca_{10}F_2(PO_4)_6 + 10\ H_2SO_4 + 20\ H_2O \rightarrow 6\ H_3PO_4 + 10\ CaSO_4.2\ H_2O + 2\ HF$$

The National Formulary - Thirteenth Edition

V. Specifications For Food Grade Material

Calcium Sulfate is anhydrous or contains two molecules of water of hydration. When dried at 250° to constant weight, it contains not less than 99.0 percent and not more than 101.0 percent of $CaSO_4$.

Description - Calcium Sulfate occurs as a fine, white to slightly yellow-white, odorless powder.

Solubility - Calcium Sulfate dissolves in diluted hydrochloric acid. It is slightly soluble in water.

Identification - Dissolve about 200 mg. of Calcium Sulfate by warming in a mixture of 4 ml. of diluted hydrochloric acid and 16 ml. of water. This solution responds to the tests for Calcium, and for Sulfate.

Loss on Drying - Dry Calcium Sulfate at 250° to constant weight: the anhydrous form loses not more than 1.5 percent of its weight; the dihydrate loses not less than 19 percent and not more than 23 percent of its weight.

Carbonate - Mix 1 g. of Calcium Sulfate with 5 ml. of water, and add a few drops of diluted hydrochloric acid: no effervescence occurs when the acid is added.

Iron - Dissolve 200 mg. of Calcium Sulfate and about 50 mg. of ammonium persulfate in 10 ml. of diluted hydrochloric acid, dilute to 50 ml. with water, and mix. To this solution add 3 ml. of ammonium thiocyanate T.S., and mix thoroughly: the color obtained is no darker than that produced in 50 ml. of a solution containing 140 mcg. of ferrous ammonium sulfate (equivalent to 20 mcg. of Fe) when treated in the same manner (100 parts per million of Fe).

Heavy metals - Mix 2 g. of Calcium Sulfate with 20 ml. of water, add 25 ml. of diluted hydrochloric acid, and heat to boiling to dissolve the sample. Cool, and add stronger ammonia water to a pH of 7. Filter, evaporate to a volume of about 25 ml., and refilter if necessary to obtain a clear solution: the heavy metals limit for Calcium Sulfate is 10 parts per million.

Assay - Dissolve about 300 mg. of Calcium Sulfate, previously dried at 250° to constant weight and accurately weighed, in 100 ml. of water and 4 ml. of diluted hydrochloric acid. While stirring, preferably with a magnetic stirrer, titrate as follows: add about 30 ml. of 0.05M disodium ethylenediaminetetraacetate from a 50-ml. buret, then add 15 ml. of sodium hydroxide T.S. and 300 mg. of hydroxy naphthol blue, and continue the titration to a blue endpoint. Each ml. of 0.05 M disodium ethylenediaminetetraacetate is equivalent to 6.807 mg. of $CaSO_4$.

Packaging and storage - Preserve Calcium Sulfate in well-closed containers.

Labeling - The label should indicate whether the Calcium Sulfate is anhydrous or the dihydrate.

Food Chemicals Codex - First Edition

Specifications For Food Grade Material cont'd

$CaSO_4.2H_2O$ Calcium Sulfate

Description - A fine, white to slightly yellow-white, odorless powder. It is slightly soluble in water, but dissolves in dilute hydrochloric acid solutions.

Identification - Dissolve about 200 mg. by warming with a mixture of 4 ml. of diluted hydrochloric acid T.S. and 16 ml. of water. A white precipitate

forms when 5 ml. of ammonium oxalate T.S. is added to 10 ml. of the solution. Upon the addition of barium chloride T.S. to the remaining 10 ml., a white precipitate forms which is insoluble in hydrochloric and nitric acids.

Specifications - Assay. Not less than 99 percent and not more than the equivalent of 105 percent of $CaSO_4.2H_2O$.

Limits of Impurities - Arsenic (as As). Not more than 3 parts per million (0.0003 percent).

Fluoride. Not more than 30 parts per million (0.003 percent).

Heavy Metals (as Pb). Not more than 10 parts per million (0.001 percent).

Selenium. Not more than 30 parts per million (0.003 percent).

TESTS

Assay. Dissolve about 350 mg., accurately weighed, in 100 ml. of water and 4 ml. of diluted hydrochloric acid T.S. While stirring, preferably with a magnetic stirrer, add about 30 ml. of 0.05 M di-sodium ethylenediaminetetraacetate from a 50-ml. buret, then add 15 ml. of sodium hydroxide T.S. and 300 mg. of hydroxy naphthol blue indicator, and continue the titration to a blue end-point. Each ml. of 0.05 M dosodium ehtylenediaminetetraacetate is equivalent to 8.609 mg. of $CaSO_4.2H_2O$.

Arsenic. Mix 1 gram with 10 ml. of water, add 12 ml. of diluted hydrochloric acid T.S., and heat to boiling to dissolve the sample. Cool, filter, and dilute the filtrate to 35 ml. with water. This solution meets the requirements of the Arsenic Test.

Fluoride. Weigh accurately 1.67 grams, and proceed as directed in the Fluoride Limit Test.

Heavy metals. Mix 2 grams with 20 ml. of water, add 25 ml. of diluted hydrochloric acid T.S., and heat to boiling to dissolve the sample. Cool, and add ammonium hydroxide to a pH of 7. Filter, evaporate to a volume of about 25 ml., and refilter if necessary to obtain a clear solution. This solution meets the requirements of the Heavy Metals Test, using 20 mcg. of lead ion (Pb) in the control (Solution A).

Selenium. A solution of 2 grams in 40 ml. of dilute hydrochloric acid (1 in 2) meets the requirements of the Selenium Limit Test.

Packaging and storage. Store in well-closed containers.

Functional use in foods. Nutrient supplement; yeast food; dough conditioner; firming agent.

VI. Typical Analysis

The process for converting wet Calcium Sulfate cake to Food Grade $CaSO_4.2H_2O$ is simply one of drying. The wet cake contains 24-29% free water. When dried, the typical analysis is as follows:

Description	White to off white powder
pH	4.5 @ 20°C
Iron	15.3 ppm
Heavy Metals	* LT 10 ppm
Fluoride	0.15 ppm
Selenium	Neg.
Assay	99.81%
Loss on Drying	19.7%
Identification	Passes Test
Arsenic	* LT 3 ppm
Carbonate	Neg.
Solubility	Passes Test

*Less than

REFERENCES:

Page 1, footnote (1):

Abstracted from The Merck Index - 8th Edition, Page 196, Pub. Merck & Co., Inc. Rahway, N.J., U.S.A. 1968

Page 1, footnote (2):

K. K. Kelly, J. C. Southard, and C. T. Anderson, U. S. Beer Mines Tech. Papers, 625, 3 (1941)

Page 4, footnote (3):

Review: Hammond in Kirk-Othmer Encyclopedia of Chemical Technology, Vol. 4, 2nd Edition, Interscience, 1964.

November 20, 1974

LEACHING STUDIES ON CALCIUM SULFATE

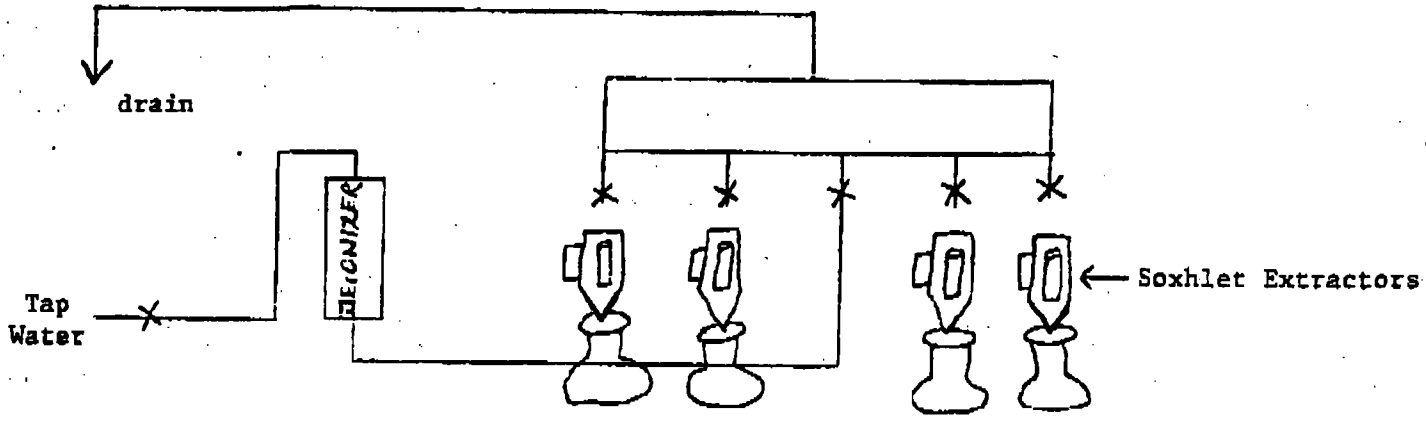
A leaching study was performed on both the wet calcium sulfate as it now is, and on repulped calcium sulfate, which will be representative of the calcium sulfate after March 1, 1975, at which time the calcium sulfate will be filtered then repulped in water and again filtered. Test design and results follow:

Test Design

Tap water was run through an IWT ion exchanger research model II available from Campbell Industrial Sales, P.O. Box 629, Carmel, Indiana. The deionizer fed a four spigot manifold with flow control valves at each spigot.

50 grams each of wet calcium sulfate cake, repulped calcium sulfate cake, and a control of local soil, were placed in separate Whatman Cellulose Extraction Thimbles - single thickness - 33 x 94 mm. An empty thimble was used in the fourth unit as a blank.

The deionized water was dripped into the thimbles at a rate of 200 ml/hour and collected for chemical analysis. Three 200 ml. extractions were collected for each sample. All cation results are by atomic absorption. The aliquot used was first concentrated by four, then acidified with HCl and analyzed. All other test procedures are explained with the data. All data is expressed - as is - in the 200 ml. segment collected. All extractions done at ambient temperatures, approximately 72°F.



	I			II			III			IV	
	Wet Calcium Sulfate Cake			Repulped Calcium Sulfate Cake			Elkhart Soil			Deionized Water Used	
Test	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd
Calcium ppm	625	585	575	683	330	284	150	2.0	2.1	1.4	.23
Magnesium ppm	1.4	.08	.025	.065	.05	LT .02	1.2	1.0	.44	.22	.04
Sulfate ppm(1)	1504	1455	1306	960	636	662	20	10	LT 10	neg	neg
Iron ppm	.4	LT.05	LT.05	.2	LT.05	LT .05	3.7	2.2	1.0	LT.05	LT.05
Copper	.11	.07	.10	.12	.10	.07	.15	.11	.06	.1	.1
Zinc ppm	.10	.01	.02	.11	.02	.01	.06	.04	.01	.02	.005
Chromium ppm	LT.025	LT.025	LT.025	LT.025	LT.025	LT.025	LT.025	LT.025	LT.025	LT.025	LT.025
Aluminum ppm	LT.05	LT.05	LT.05	LT.05	LT.05	LT.05	1.2	.09	.25	.11	LT.05
Silica ppm	1.5	.5	.5	.9	.8	1.0	5.1	4.0	4.1	3	2.1
Sodium	6.4	0.6	.43	4.4	.8	.42	22	4.4	0.4	1.2	.40
Manganese ppm	0.9	LT.025	LT.025	.05	.04	LT.025	.42	.11	.05	LT.025	LT.025
Molybdenum ppm	LT.05	LT.05	LT.05	LT.05	LT.05	LT.05	LT.05	LT.05	LT.05	LT.05	LT.05
Potassium ppm	2.7	.27	.12	1.7	.24	.05	2.4	1.2	.51	.12	.025
Chloride(2)	LT 10	LT 10	LT 10	LT 10	LT 10	LT 10	LT 10	LT 10	LT 10	neg	neg
Total Dissolved Solids(3) ppm	1925	1983	1769	1253	889	907	125	40	42	0	0
pH at 25°C	3.30	4.72	4.87	3.31	4.44	5.00	6.42	6.74	6.62	4.60	4.60
Total Acidity(4) Normal NaOH	10 ml / 100 ml	10 ml / 100 ml	10 ml / 100 ml	10 ml / 100 ml	10 ml / 100 ml	10 ml / 100 ml	6 ml / 100 ml	10 ml / 100 ml	9 ml / 100 ml	10 ml / 100 ml	10 ml / 100 ml
Color O.D.(5)	.05	.05	.05	.05	.05	.05	2.30	0.65	0.45	-	-
Citric Acid Content	LT.01%	LT.01%	LT.01%	LT.01%	LT.01%	LT.01%	LT.01%	LT.01%	LT.01%	LT.01%	LT.01%
Heavy Metal(6)	LT3ppm	LT3ppm	LT3ppm	LT3ppm	LT3ppm	LT3ppm	LT3ppm	LT3ppm	LT3ppm	LT3ppm	LT3ppm

Abbreviations: LT = Less Than

ANALYTICAL PROCEDURES

1. Sulfate

   50 mls. sample + 1 g. $BaCl_2$. Filter through a weighed crucible with asbestos mat. Rinse with methyl alcohol, dry at 105°C for 2 hours. Record weight gain as $BaSO_4$.

   (mg. $BaSO_4$) x 0.412 = wt. SO_4 50 mls. in mgs.
   wt. SO_4 in 50 mls. x 20 = ppm SO_4

2. Chloride

   (Volhard Method) Standard Methods for the Examination of Water, Sewerage and Industrial Wastes, Tenth Edition, page 59.

3. Total Dissolved Solids

   As above pg. 178 - Total Residue

4. Total Acidity

   As above pg. 34

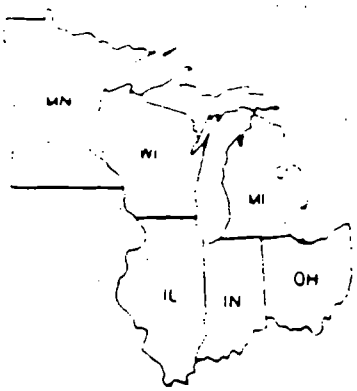
5. Color

   Direct spectrophotometer reading at 420 mm vs. blank.
   Lumetron used, 19 mm rounded curvette.

6. Heavy Metals - U.S.P. XIII

United States Environmental Protection Agency
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604

EPA



Superfund Division

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Date: 1/5/05 **Number of pages, including cover:** 24

Message: Mimi, This is the last fax Regarding the information from IDEM.

Thanks
Gwen

Signature: